

- **Reach CS2-IX06 (Wildcat Creek)** extends from the Markland Avenue bridge upstream 2,580 feet (786 meters) to the low-head dam above Phillips Street.
- **Reach CS2-IX07 (Wildcat Creek)** is a fish sampling reach located 3,696 feet (1,127 meters) upstream of Delco Park. The macroinvertebrate sampling reach is in a riffle just below the dam, Kokomo Waterworks Reservoir No. 2.
- **Reach CS2-IX08 (Little Deer Creek)** extends upstream from the Highway 29 bridge about 850 feet (259 meters). It is located in Carroll County, east of State Highway 29 and north of Sharon, Indiana.

Background

Watershed Descriptions

Wildcat Creek. The Wildcat Creek basin is a post-glacial stream basin that follows the basic bedrock valley of a pre-glacial river (IDNR 1980). The watershed encompasses 804 square miles (2,082 square kilometers) in seven different counties and roughly 425 miles (1,101 square kilometers) of perennial streams (IDEM 2000). The entire watershed, located in the Eastern Corn Belt plains ecoregion, is characterized by beech/maple vegetation. The meandering drainage system is comprised of three forks: North, Middle, and South. The North Fork of Wildcat Creek is often referred to as the main stem.

The North Fork of the Wildcat Creek originates in Grant, Madison, and Tipton Counties and flows westward through Howard and Carrol Counties before joining the Middle and South Forks in Tippecanoe County. Wildcat Creek eventually flows into the Wabash River near the city of Lafayette in Tippecanoe County. The North Fork flows through the city of Kokomo and is influenced by urban and industrial runoff. The study area is located on the North Fork Wildcat Creek in the vicinity of the CSSS in Kokomo, Indiana.

The aquatic life use classification for Wildcat Creek is "a well-balanced, warm water aquatic community" (Indiana Administrative Code [IAC] Title 327, Article 2, Section 3, Water Quality Standards). Biological studies conducted by the Indiana Department of Environmental Management (IDEM) and Indiana Department of Natural Resources (IDNR) have identified biologically impaired reaches in the watershed, which includes the study area.

Kokomo Creek. Kokomo Creek is located in the Wildcat Creek watershed. The geology of the watershed is similar to that of Wildcat Creek, as they are both highly influenced by glacial activity. Kokomo Creek is about 16 miles (26 kilometers) long and its watershed drains 36 square miles (93 square kilometers). Most of the creek is located in Howard County. The upper portion of the watershed is predominantly agricultural, while the lower portion is more shaded and is typically characterized as pool-riffle-pool.

The aquatic life use classification for Kokomo Creek is "capable of supporting a well-balanced, warm water aquatic community" (IAC Title 327, Article 2, Section 3, Water Quality Standards). Biological studies were conducted by IDEM and IDNR.

Little Deer Creek. Little Deer Creek is located in Howard and Carroll Counties. The watershed above Highway 29 encompasses an area of roughly 80 square miles (207 square kilometers). Land use is primarily agricultural and urban riparian habitat, with some forest habitat present. The geology of this watershed is similar to Wildcat and Kokomo Creeks.

Methods

The methods used in the field investigation followed those presented in the document *Project Instructions: Data Acquisition Task* (CH2M HILL 2001).

Results

Physical Characterization/General Water Quality Assessment

Table 1 summarizes water quality (in situ) and general physical characteristics of the studied stream reaches (see also Attachment 1, *Field Data Sheets*). Water quality parameters varied little between sample locations and were within acceptable standards for the protection of aquatic life (IAC, Title 327, Article 2, Water Quality Standards). The predominant land use in study reaches adjacent to the CSSS is primarily commercial/industrial, while background study reaches are largely agricultural. Inorganic substrate material was dominated by gravel, sand, and cobble, respectively. Organic substrate material was largely detritus.

Habitat Assessment

Habitat quality and quantity affect the structure and composition of fish and benthic macroinvertebrate communities. A qualitative habitat assessment was conducted within each stream reach to evaluate if key physical characteristics of the water body and surrounding land use were limiting the aquatic community.

Table 2 (see also Attachment 2, *Field Data Sheets*) presents the six habitat categories evaluated for Wildcat, Kokomo, and Little Deer Creeks, along with qualitative scores for each habitat category. The scores were summed for each reach and compared to established habitat quality ratings for warmwater habitat (Rankin 1991).

Habitat quality was then compared to aquatic life support criteria for warm water streams (Figure 5; IDEM 2000). Reaches 5 and 6 in Wildcat Creek were partially supporting, and reach CS2-IX04 in Kokomo Creek did not meet minimal criteria for aquatic life use support. Non-support in Kokomo Creek was based primarily on poor substrate material, high bank erosion, and a straight, highly incised channel.

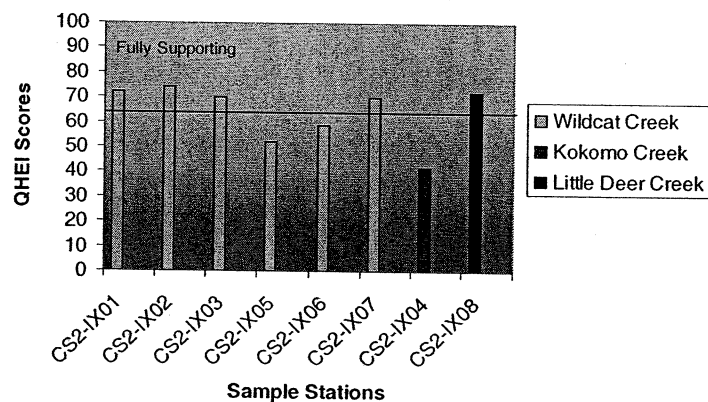


FIGURE 5
QHEI Scores

TABLE 1

Water Quality and Physical Characteristics at Wildcat, Kokomo, and Little Deer Creek Bioassessment Reaches, June 2001.

Parameter	Units	Wildcat Creek						Kokomo Creek		Little Deer Creek	
		Reach						Reach			
		CS2-IX01	CS2-IX02	CS2-IX03	CS2-IX05	CS2-IX06	CS2-IX07	CS2-IX04		CS2-IX08	
Date/Time		6/12/01-1027	6/13/01-1050	6/14/01-1114	6/14/01-1310	6/19/01-1240	6/16/01-1028	6/15/01-0758		6/18/01-0844	
Dissolved Oxygen	mg/L	9.28	8.93	8.28	9.28	6.77	8.82	8.79		8.35	
Temperature	°C	21.03	22.3	24.45	25.58	25.18	24.21	23.4		19.9	
pH	units	7.8	7.7	7.76	8.03	7.84	7.36	7.48		7.12	
Specific Conductance	µmhos	674	629	654	656	535	486	630		566	
Hardness	mg/L as CaCO ₃	295	290	281	273	254	250	292		322	
Turbidity	NTU	4.3	3.2	5.3	3.6	NS	NS	NS		NS	
Predominant land use		Agricultural/ Industrial	Industrial	Commercial/ Industrial	Commercial/ Industrial	Residential/ Industrial	Agricultural/ Residential	Commercial/ Industrial		Agricultural	
High water mark	m	2	3	2	2	1	1	2		1	
Velocity	fps	0.27	0.26	0.27	0.27	1.37	2.04	0.14 est.		0.5 est.	
Percentage of Inorganic Substrate											
Boulder		10	10	10	10	5	20	5		5	
Cobble		40	10	20	20	5	20	10		15	
Gravel		30	50	50	50	10	30	30		30	
Sand		20	20	20	10	60	30	45		30	
Silt			10		10	20		10		20	
Clay											
Percentage of Organic Substrate											
Detritus		100	100	85	90	90	80	70		100	
Muck-mud				10	10	10		20			
Marl				5			20	10			

mg/L = Milligrams per liter.

µmhos/cm = Micromhos per centimeter.

m = Meter.

fps = Feet per second.

°C = Degrees Celsius.

NTU = Nephelometric turbidity units

est. = estimate

TABLE 2

Summary of Habitat Quality Index Scoring for Wildcat, Kokomo, and Little Deer Creek Bioassessment Reaches, June 2001

Wildcat Creek		Kokomo Creek	Little Deer Creek					
Habitat Parameter ^a	Reach						Reach	
	CS2-IX01	CS2-IX02	CS2-IX03	CS2-IX05	CS2-IX06	CS2-IX07	CS2-IX04	CS2-IX08
Substrate	14	15	14	12	8	17	6	15
Instream Cover	19	18	15	13	15	13	9	15
Channel Morphology	16	12	10	7	7	13	5	15
Riparian Zone and Bank Erosion	4	2	4	2	4	7	2	5
Pool/Glide and Riffle/Run Quality	9	17	17	8	15	12	12	12
Gradient	10	10	10	10	10	8	8	10
Total Score	72	74	70	52	59	70	42	72
Resulting Habitat Quality	Good	Good	Good	Fair	Fair	Good	Poor	Good
Aquatic Life Use Support ^b	Full	Full	Full	Partial	Partial	Full	Not Supporting	Full

Habitat Characteristics:

- > 75 Excellent Habitat Heterogeneity
- > 60 Good Habitat Heterogeneity
- > 45 Fair Habitat Heterogeneity
- > 30 Poor Habitat Heterogeneity
- < 30 Habitat Limited

^a Based on Ohio QHEI format^b Based on IDEM, 2000

Aquatic Community Investigation

Benthic Macroinvertebrate Community

Benthic macroinvertebrates collected within the study area are summarized in Attachment 3. The benthic macroinvertebrate community structure was used to assess potential impairment to aquatic life use. The data were analyzed using a set of metrics (measurement end points) which reflect community characteristics that fluctuate according to the degree of impairment (IDEM 2000a).

Table 3 presents the results of the macroinvertebrate assessment. The range in macroinvertebrate Index of Biotic Integrity (mIBI) scores for the Wildcat Creek study area was 3.4 (background reach CS2-IX07, downstream of Kokomo Reservoir) to 5.2 (reach CS2-IX02, from Dixon Street bridge upstream to railroad bridge). Based on the mIBI scores and the corresponding narrative, the Wildcat Creek study area was considered slightly impaired, except for the background reach, which was classified as moderately impaired. The Kokomo Creek study reach had an mIBI score of 4.0, and the score for Little Deer Creek, the background site, was 5.2. Both sites were classified as slightly impaired. Based on macroinvertebrate assessments, only the background reach CS2-IX07 was not meeting its full aquatic life use support (Table 3 and Figure 6).

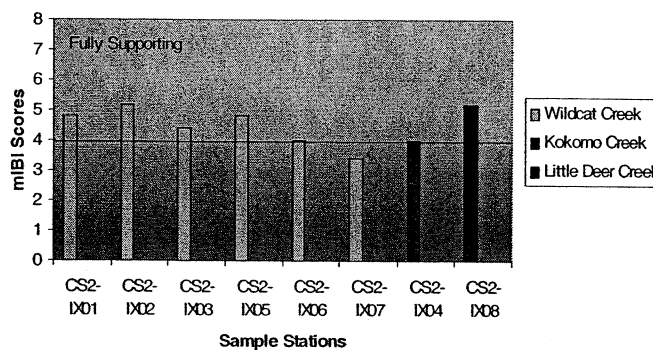


FIGURE 6
mIBI Scores

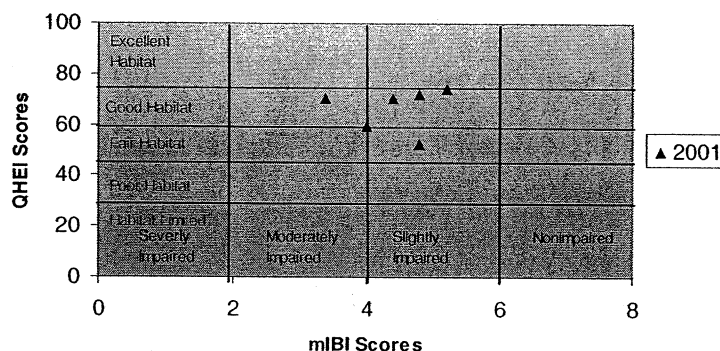


FIGURE 7
Comparison of Habitat and mIBI Scores, Wildcat Creek

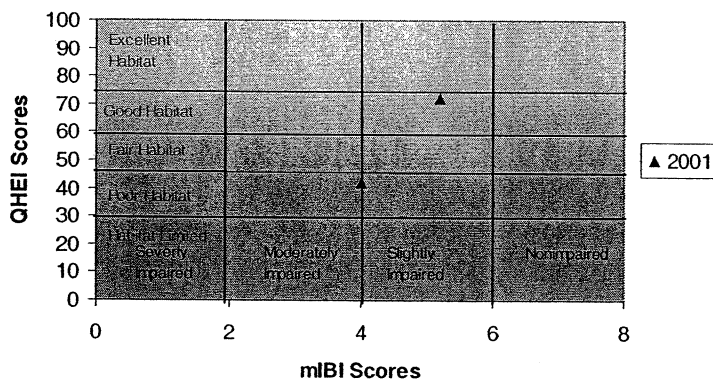


FIGURE 8
Comparison of Habitat and mIBI Scores, Kokomo and Little Deer Creeks

A comparison of mIBI scores against qualitative habitat evaluation index (QHEI) scores was conducted to assist in assessing potential aquatic life use support impairment (Figures 7 and 8). Habitat was generally not a limiting factor to the benthic community structure for stream reaches in Wildcat Creek. Based on the criteria for aquatic life use support (IDEM 2000), all

TABLE 3

Metric Values and mIBI Scores for Wildcat, Kokomo, and Little Deer Creek Bioassessments (Benthic Macroinvertebrates), June 2001.

Metrics	Wildcat Creek						Kokomo Creek	Little Deer Creek
	Metric Value						Metric Value	
	CS2-IX01	CS2-IX02	CS2-IX03	CS2-IX05	CS2-IX06	CS2-IX07	CS2-IX04	CS2-IX08
Taxa Richness ^a	34	37	31	39	31	24	32	48
EPT Index ^b	5	6	5	9	5	2	4	13
EPT Taxa Abundance ^c	3503	1965	6742	860	1809	20	1735	3362
EPT Count to Total Number of Individuals ^d	0.320	0.350	0.290	0.08	0.02	0.01	0.12	0.39
Number of Individuals ^e	10822	5574	23564	10825	79131	3612	13947	8576
Biotic Index (HBI) ^f	6.54	6.53	6.54	7.17	6.9	7.78	6.15	5.84
% Dominant Taxon ^g	19.22	18.35	22.92	17.57	34.69	32.25	23.20	23.24
EPT Count to Chironomid Count ^h	0.85	1.21	1.16	0.20	0.12	0.01	0.26	1.46
Chironomid Count ⁱ	4101	1622	5800	4222	15303	2301	6610	2303
Total Number of Individuals to Subsample size ^j	1082	557	236	1083	791	361	279	858
Metrics	Bioassessment Score						Bioassessment Score	
	CS2-IX01	CS2-IX02	CS2-IX03	CS2-IX05	CS2-IX06	CS2-IX07	CS2-IX04	CS2-IX08
Taxa Richness	8	8	8	8	8	8	8	8
EPT Index	4	6	4	8	4	0	4	8
EPT Taxa Abundance	8	8	8	8	8	8	8	8
EPT Count to Total Number of Individuals	4	4	2	0	0	0	0	4
Number of Individuals	8	8	8	8	8	8	8	8
Biotic Index (HBI)	0	0	0	0	0	0	0	0
% Dominant Taxon	8	8	6	8	4	4	6	6
EPT Count to Chironomid Count	0	2	2	0	0	0	0	2
Chironomid Count	0	0	0	0	0	0	0	0
Total Number of Individuals to Subsample size	8	8	6	8	8	6	6	8
Total Score	48	52	44	48	40	34	40	52
mIBI Score	4.8	5.2	4.4	4.8	4	3.4	4	5.2
Biological Condition ^m	Slightly Impaired	Slightly Impaired	Slightly Impaired	Slightly Impaired	Slightly Impaired	Moderately Impaired	Slightly Impaired	Slightly Impaired
Aquatic Life Use Support	Full	Full	Full	Full	Full	Partial	Full	Full

^a Total number of benthic invertebrate taxa.^b Score is the total number of distinct taxa within the orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies).^c Total number of benthic invertebrates within the orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies).^d The ratio of the number of individuals in the orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) to the total number of individuals in the sample [N] x 100.^e Total number of individuals in the sample [N].^f Hilsenhoff Biotic Index (HBI). Calculated as $\sum n_i/t_i/N$ where n_i is the number of individuals of a particular taxa, t_i is the tolerance value of that taxon, and N is the total number of organisms in the sample.^g The ratio of the number of individuals in the numerically dominant taxon to the total number of individuals in the sample [N] x 100.^h The ratio of the number of individuals in the orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) to the total number of individuals in the family Chironomidae x 100.ⁱ Total number of benthic invertebrates within the family Chironomidae.^j The total number of individuals to the subsample size.^m Macroinvertebrate Index of Biotic Integrity Point Score Ranges

Non Impaired	6.0 - 8.0
Slightly Impaired	4.0 - 5.9
Moderately Impaired	2.0 - 3.9
Severely Impaired	0 - 1.9

HBI = Hilsenhof Biotic Index

EPT = Ephemeroptera, Plecoptera, Trichoptera

of the stream reaches in the Wildcat Creek study area were considered fully supporting of the designated use (well balanced, warm water aquatic life), except for reach CS2-IX07, which was partially supporting. Since habitat was considered to be non-limiting, water quality is suspect. Comparison of mIBI and QHEI scores for Kokomo and Little Deer Creeks indicate non-support of the aquatic life use for the Kokomo Creek reach based on poor habitat quality. The benthic community structure barely met full support criteria of 4.0, and it appears that habitat quality is a probable cause.

Fish Community

Attachment 4 summarizes the fish species collected in Wildcat, Kokomo, and Little Deer Creeks. This second aquatic community component was also used to assess potential impairment to aquatic life use in the study area. The data was analyzed using a set of metrics (measurement end points) that reflected community characteristics which fluctuate according to the degree of impairment (Simon 1998). As such, current results reflect current physical and chemical characteristics within the study area based on this biological component.

Table 4 presents the results of the fish assessment. The Index of Biotic Integrity (IBI) scores ranged from 36 in the background reach (CS2-IX07) to 48 in the study reach (CS2-IX03 and CX2-IX05) for Wildcat Creek. IBI scores for Kokomo and Little Deer

Creeks were 40 and 44, respectively. The integrity classes rated between poor/fair and good. Comparison of IBI scores to aquatic life use criteria (IDEM 2000) indicates full support in all stream reaches (Table 4 and Figure 9).

Comparison of IBI and QHEI scores for Wildcat Creek study sites indicated that all stream reaches meet full aquatic life use support except CS2-IX05 and CS2-IX06 (IDEM 2000). Both reaches meet the criteria for IBI, but they were only partially supporting for habitat. Little Deer Creek, the reference condition for Kokomo Creek, met both the IBI and QHEI criteria for full

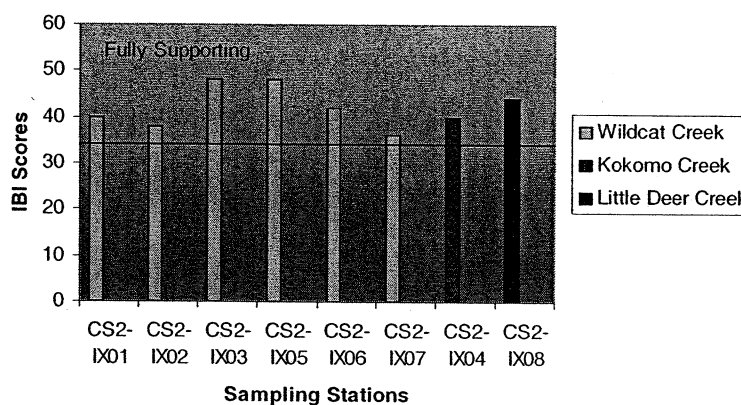


FIGURE 9
IBI Scores

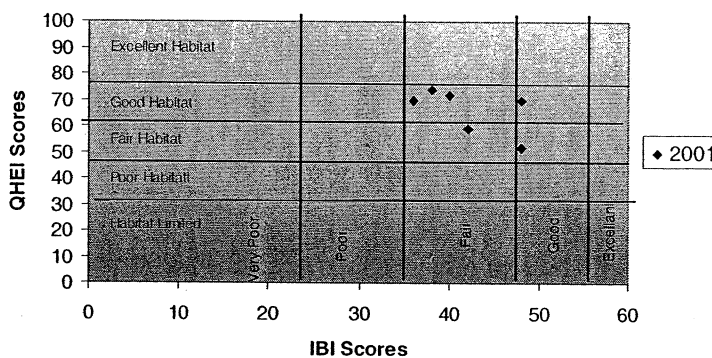


FIGURE 10
Comparison of Habitat and IBI Scores, Wildcat Creek

TABLE 4

Metric Scores and Index of Biotic Integrity Ratings for Fish Community Structure for Wildcat, Kokomo, and Little Deer Creeks, June 2001^a

Metric	Wildcat Creek						Kokomo Creek	Little Deer Creek
	Value						CS2-IX04	CS2-IX08
	CS2-IX01	CS2-IX02	CS2-IX03	CS2-IX05	CS2-IX06	CS2-IX07		
Total Number of Fish Species ^b	15	13	21	19	15	10	13	15
Number of Darter Species	0	0	2	1	0	0	1	3
Number of Sunfish Species	4	3	5	5	5	3	5	3
Number of Sucker Species	4	5	5	5	4	3	2	3
Number of Sensitive Species	6	5	9	7	4	3	4	9
Percentage Tolerant Individuals	11.6	31.4	21.1	23.6	11.2	16.0	33.3	58.1
Percentage of Individuals as Omnivores	8.9	32.40	14.9	20.0	9.6	16.0	16.7	49.6
Percentage of Individuals as Insectivores	81.5	40.2	69.3	58.6	79.2	72.0	66.7	33.1
Percentage of Individuals as Carnivores	8.2	27.5	9.6	16.4	10.4	9.3	16.7	10.5
Catch per Unit Effort	146	102	114	140	125	75	36	248
Percent Simple Lithophils Species	17.8	55.9	50.0	60.7	64.0	72.0	11.1	10.5
Percentage of Individuals with Disease or other Anomaly	7.5	9.8	7.0	10.0	10.4	2.7	0	0.8
Metric	Score							
	CS2-IX01	CS2-IX02	CS2-IX03	CS2-IX05	CS2-IX06	CS2-IX07	CS2-IX04	CS2-IX08
Total Number of Fish Species	3	3	5	5	3	3	3	5
Number of Darter Species	1	1	3	1	1	1	1	5
Number of Sunfish Species	5	3	5	5	5	3	5	3
Number of Sucker Species	5	5	5	5	5	3	3	5
Number of Sensitive Species	3	5	5	5	3	1	3	5
Percentage Tolerant Individuals	5	3	5	5	5	5	3	3
Percentage of Individuals as Omnivores	5	3	5	3	5	5	5	3
Percentage of Individuals as Insectivores	5	3	5	5	5	5	5	3
Percentage of Individuals as Carnivores	1	5	3	5	3	3	5	3
Catch per Unit Effort	3	1	1	3	1	1	1	3
Percent Simple Lithophils Species	3	5	5	5	5	5	1	1
Percentage of Individuals with Disease or other Anomaly	1	1	1	1	1	1	5	5
Total IBI Score	40	38	48	48	42	36	40	44
Integrity Class	Fair	Poor/Fair	Good	Good	Fair	Poor/Fair	Fair	Fair
Aquatic Life Use Support ^c	Full	Full	Full	Full	Full	Full	Full	Full

Total IBI Score and Integrity Class^a

58 - 60 Excellent

48 - 52 Good

40 - 44 Fair

28 - 34 Poor

12 - 22 Very Poor

No Fish

IBI = Index of Biotic Integrity

DELTS = Discoloration, Deformities, Eroded Fins, Excessive Mucus, Excessive External Parasites, Fungus, Poor Condition, Reddening, Tumors, and

^a Metric selection, scores, and integrity class based on Simon, 1998

support of aquatic life use (Figure 10). However, reach CS2-IX04 (Kokomo Creek) did not meet the criteria for full support due to habitat limitations (Figure 11).

Biological Tissue Contaminant Analysis

Vertebrate (fish) and invertebrate (crayfish) tissues samples were obtained from each stream reach within the study area to add to the weight

of the evidence for the sediment removal action. Samples of whole body tissue from fish species that were primarily bottom feeders which would likely come in contact with contaminated sediments were collected. Results for fish tissue were assessed by comparing the whole body concentration against fish consumption advisory values, although the advisory values were for fillets (skin-on). Results for invertebrates were compared to background levels.

Sample results are presented in Attachment 5 and Table 5. Eleven inorganic and two organic chemicals were identified in the invertebrate tissue samples. Of the organics, polychlorinated biphenyls (PCBs) were further identified to three specific Aroclor compounds (1248, 1254, and 1260). Many of the identified inorganics are biologically important nutrients (calcium, iron, potassium, and sodium). Other inorganics, such as copper and zinc, have a low bioaccumulation potential. Results for aluminum, barium, manganese, magnesium, and selenium (slightly above the reporting limit) were similar to background concentrations. The only semivolatile organic compounds (SVOC) detected, other than PCBs, was bis(2-ethylhexyl) phthalate. This contaminant was above the reporting limit within reaches CS2-IX05 and CS2-IX06. Elevated levels of Aroclor 1248 and 1254 were noted in study reaches of Wildcat Creek compared to background (Table 5). Aroclor 1260 was below background within the CSSS study area. All measured PCB Aroclors were above background in the Kokomo Creek study reach (Table 5).

Fifteen inorganic and two organic chemicals were identified in vertebrate tissue (fish tissue). Of the organics, PCBs were further identified to three specific Aroclor compounds (1248, 1254, and 1260). Again, many of the identified inorganics are biologically important nutrients (calcium, iron, potassium, and sodium). Others, such as aluminum, barium, chromium, magnesium, manganese, and selenium, were below reporting limits or less than background. Copper concentrations were slightly above the reporting limits and background in Wildcat Creek, and substantially elevated in Kokomo Creek. Elevated levels of lead and zinc were also noted in Kokomo Creek. Levels of mercury were generally at or near reporting limits, and were well below the Indiana fish consumption advisory level for group 1, unrestricted consumption. As with invertebrate tissue, bis(2-ethylhexyl) phthalate was the only other SVOC noted above detection limits in fish tissue besides PCBs. Levels of bis(2-ethylhexyl) phthalate were generally at or near reporting limits or background levels. PCBs were elevated above fish advisory levels in most sample reaches, including background for Wildcat Creek. Reach CS2-IX06 was the only reach with PCB levels within

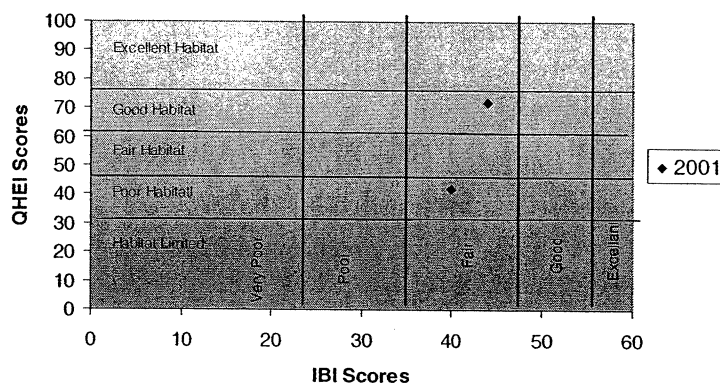


FIGURE 11
Comparison of Habitat and IBI Scores, Kokomo and Little Deer Creeks

TABLE 5

Tissue Constituents Above Detection Limits for Wildcat, Kokomo, and Little Deer Creeks, June, 2001

Wildcat Creek										Kokomo Creek	Little Deer Creek
Parameter/Description	Units	Reporting Limits (Range)	Value								
			CS2-IX01	CS2-IX02	CS2-IX03	CS2-IX05	CS2-IX06	Background IX07	CS2-IX04	BackgroundCS2-IX08	
Invertebrates											
Inorganics											
Aluminum	mg/kg	(18-20)	NS	20	21	32	21	41	36	21	
Barium	mg/kg	(0.45-0.5)	NS	11	8	11	12	21	17	17	
Calcium	mg/kg	(9-20)	NS	18000	18000	20000	18000	26000	26000	26000	
Copper	mg/kg	(0.90-1)	NS	31	26	34	31	30	26	22	
Iron	mg/kg	(9-10)	NS	41	40	66	47	56	77	36	
Magnesium	mg/kg	(4.5-5)	NS	330	280	360	350	440	430	380	
Manganese	mg/kg	(0.18-2)	NS	12	12	14	14	13	28	20	
Potassium	mg/kg	(45-99)	NS	1600	1400	1800	1800	1600	1900	1800	
Selenium	mg/kg	(0.9-1)	NS	0.99	1	0.98	0.93	0.98	0.97	1.3	
Sodium	mg/kg	(90-100)	NS	1400	1200	1500	1700	1600	1700	1600	
Zinc	mg/kg	(1.8-2)	NS	16	14	18	17	19	20	16	
Organics											
Bis(2-Ethylhexyl) Phthalate	ug/kg	670	NS	670	670	690	1100	670	670	670	
Aroclor 1248	ug/kg	(50-210)	NS	610	490	140	58	50	970	50	
Aroclor 1254	ug/kg	(50-210)	NS	810	420	460	480	320	1200	50	
Aroclor 1260	ug/kg	(50-210)	NS	85	50	64	58	340	210	50	
Lipid	%		NS	2.06	1.99	1.75	1.87	2.13	2.79	1.62	
Fish											
Inorganics											
Aluminum	mg/kg	(18-20)	19	19	20/41	27	19	19	18	19	
Barium	mg/kg	(0.45-0.5)	0.48	0.64	0.5/0.99	1.6	2.5	1.6	1.6	2	
Calcium	mg/kg	(9.1-9.9)	4800	7900	3600/12000	5700	11000	6900	12000	4700	
Chromium	mg/kg	(0.27-0.30)	0.29	0.28	0.30/0.37	0.29	0.28	0.29	0.27	0.28	
Copper	mg/kg	(0.91-0.99)	1.2	1.7	4.4/0.95	1.4	1.7	0.97	19	0.93	
Iron	mg/kg	(9.1-9.9)	11	12	33/12	58	9.4	9.7	12	9.3	
Lead	mg/kg	(0.45-0.50)	0.48	0.47	0.50/0.48	0.49	0.47	0.49	1.1	0.47	
Magnesium	mg/kg	(0.45-5.0)	300	360	280/380	330	430	330	370	310	
Manganese	mg/kg	(0.18-0.2)	1.5	4.2	1.8/4.5	3.4	4.1	2.8	3.9	4.5	
Mercury	mg/kg	0.033	0.065	0.033	0.033/0.069	0.033	0.046	0.033	0.048	0.033	
Nickel	mg/kg	(0.45-0.50)	0.48	0.47	0.50/0.48	0.49	0.47	0.49	0.93	0.47	
Potassium	mg/kg	(230-250)	3200	2700	2800/2800	2600	3000	2900	2200	3100	
Selenium	mg/kg	(0.91-0.99)	1.1	1.2	0.99/1.1	1.5	1.7	1.4	1.1	2.2	
Sodium	mg/kg	(91-99)	590	730	510/990	670	730	670	970	640	
Zinc	mg/kg	(1.8-2)	6.8	10	9.3/14	11	13	12	22	10	

TABLE 5

Tissue Constituents Above Detection Limits for Wildcat, Kokomo, and Little Deer Creeks, June, 2001

Parameter/Description	Units	Reporting Limits (Range)	Wildcat Creek					Kokomo Creek		Little Deer Creek	
			Value					Value		Value	
			CS2-IX01	CS2-IX02	CS2-IX03	CS2-IX05	CS2-IX06	Background IX07	CS2	CS2-IX04	BackgroundCS2-IX08
Organics											
Bis(2-Ethylhexyl) Phthalate	ug/kg	670	670	670	670/680	670	720	670	670	670	
Aroclor 1248	ug/kg	(50-750)	4200	4500	7300/7300	430	50	1400	1700	130	
Aroclor 1254	ug/kg	(50-750)	4500	4500	6200/6600	340	50	1100	3100	130	
Aroclor 1260	ug/kg	(50-750)	500	520	750/750	100	50	200	500	130	
Lipid	%		3.39	8.58	5.81/5.92	2.67	1.11	1.2	1.58	1.49	

Grouping Categories - Fish Consumption Advisory

Grouping Categories - Fish Consumption Advisory	Total PCBs (Fillet Skin-On)		Mercury
	GLSFAT ^a	Indiana ^b	
Unrestricted Consumption 1	0 - 0.05 ppm	0 - 0.05 ppm	Indiana
	0.56 - 0.22 ppm	0.06 - 0.20 ppm	< 0.16 ppm
	0.23 - 0.95 ppm	0.20 - 1.0 ppm	0.16 - 0.65 ppm
	0.96 - 1.89 ppm	1.1 - 1.9 ppm	0.66 - 2.80 ppm
	> 1.89 ppm	> 1.9 ppm	2.81 - 4.5 ppm
5			> 4.5 ppm

^a Great Lakes Sport Fish Advisory Task Force (GLSFATF). 1993. Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory.^b Indiana Department of Environmental Management (IDEM). April 2001. Fish Consumption Risk Assessment. Fact Sheet, IDEM/32/01/024/2001.

the consumption advisory group 1 range. Reach CS2-IX3 had the highest concentrations, with values as high as 7.3 ppm.

Discussion and Conclusions

Physical Characterization/General Water Quality Assessment

General water quality parameters were within acceptable standards for the protection of aquatic life (IAC, Title 327, Article 2, Water Quality Standards).

Habitat Assessment

Habitat quality, as assessed by the QHEI, was generally supportive of aquatic life use in most Wildcat Creek study reaches except for CS2-IX05 and CS2-IX06. These two reaches were partially supporting due to the impounding of the creek by a low-head dam in reach CS2-IX05, straight channel, reduced riparian zone, and bank erosion. Removal of the dam, implementation of bank stabilization, increases in riparian zone width, and establishment of instream riffle/pool complexes in these reaches would improve habitat quality.

Habitat quality in the Kokomo Creek study reach did not support the designated aquatic life use. Poor substrate, highly incised channel, extensive bank erosion, lack of a riffle/pool system, and poor riparian zone contributed to the non-support assessment. Extensive stream restoration would be needed to improve habitat quality in this stream reach.

Aquatic Community Investigation

The benthic community assessment indicated some impairment in community structure throughout the study area, but not enough to reduce the aquatic life use from full support, except for the Wildcat Creek background site. Comparison of benthic macroinvertebrate data from this study with IDEM data collected over several years also indicated partial support at the same stream reach below the Kokomo Reservoir. A comparison of benthic data with a study done on Kokomo Creek (Bright 2000) also indicated a slight impairment.

The fish community assessment for all study reaches indicated full support of designated aquatic life use.

Biological tissue samples were collected to assist in the weight of evidence for the sediment removal action. Both invertebrate (crayfish) and vertebrate (fish) tissue contained high levels of PCBs within the study reaches adjacent to CSSS.

References

- Bright, G.R. *Rapid Bioassessment of the Kokomo Creek Watershed Using Benthic Macroinvertebrates*. Conducted for Soil and Water Conservation District of Howard County. 2000.
- CH2M HILL. *Project Instructions: Data Acquisition Task. Continental Steel Superfund Site. Kokomo, Indiana*. WA No. 122-RDRD-05BW/Contract No. 68-W6-0025. 2001.
- Great Lakes Sport Fish Advisory Task Force (GLSFATF). *Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory*. 1993.
- Indiana Administrative Code. Title 327, Article 2, Section 3. Water Quality Standards, Surface Water Use Designations. 1997.

IDEM. *Fish Consumption Risk Assessment*. Fact Sheet, IDEM/32/01/024/2001. April 2001.

IDEM. *Indiana Water Quality Report 2000*. IDEM/34/02/001/2000. IDEM, Office of Water Management, Planning and Restoration Branch, Indianapolis, Indiana. 2000.

IDEM. Personal Communication, letter from Steven A. Newhouse, Senior Environmental Manager, Biological Studies Section, Office of Water Management. April 26, 2000. 2000a.

Indiana Department of Natural Resources. *A Plan for Preservation and Management of Wildcat Creek*. Indiana Natural Rivers System Study. 1980.

Rankin, E.T. *The Use of the Qualitative Habitat Evaluation Index for Use Attainability Studies in Streams and Rivers in Ohio*. Ohio EPA. 1991.

Simon, T. P. and R. Dufour. *Development of Index of Biotic Integrity Expectations for the Ecoregions of Indiana. V. Eastern Corn Belt Plain*. U.S. Environmental Protection Agency, Region 5. Water Division, Watershed and Non-Point Source Branch. EPA 905-R-96/004. 1998.